Chapter 4
GD&S Organizational Structure

4-1. Background, Responsibilities, Location of GD&S in a Command

This chapter describes an organizational model for GD&S usage within USACE and can be used as a guide in determining the level of GD&S functionality and responsibility that is appropriate for each Command. The organizational model presented here is intended to help address some of the issues raised in the U.S. Army Corps of Engineers Geospatial Data and Systems Management Report (Draft, May 2000), which is available via the internet at http://gis.usace.army.mil/GDM.PDF.

The location of GD&S within a USACE Command is a determination to be made at the Command level. All business areas in the Corps use GD&S. GD&S functionality should be made available to all USACE mission areas.

a. Districts. The Districts are to have fully functional geospatial data systems to meet project needs and mission requirements. This includes the GD&S necessary for data collection and database creation, geospatial analysis, and product generation. GD&S activities will normally be distributed across the various functions in the District. Currently, there are two models that Districts have used in implementing Geospatial Technology: Functional and Enterprise. Under the Functional model, the technical divisions (i.e., Engineering, Planning, Real Estate, Operations,) each operate a GDS that meets their particular requirements. Centralized oversight and technical committees provide the structure necessary to prevent redundant data acquisition and improve efficiency by providing guidance on training and hardware and software purchases and through the sharing of experiences and expertise.

b. Divisions. The Divisions typically require less geospatial data system functionality than the Districts. The functionality required is that which will allow Division staff to view, using commercially available tools such as ArcView or an Internet Browser, geospatial data products created by the Districts so they can make management decisions, conduct executive briefings, maintain an overview of the Division activity, and coordinate GD&S activities within the Division. The Division shall make the metadata for any in-house data sets available to either the National Geospatial Data Clearinghouse where appropriate. Division geospatial viewers shall be developed in coordination with HQ corporate viewing tools.

The primary roles of the Division with respect to GD&S are to foster coordination and communication among the Districts within the Division and to strive to eliminate unshared pockets of data. The Divisions are to serve as GD&S advocates by hosting technology exchange meetings of their respective Districts and by fostering a coordinated Enterprise approach throughout their Division. The Divisions may choose to conduct meetings through in-person meetings, teleconferences, video teleconferences, or web meeting tools. It is advisable for the Divisions to host an in-person meeting one per year.

c. Engineer Research and Development Center (ERDC). ERDC is comprised of 7 laboratories. ERDC laboratories require complete geospatial data systems functionality to meet their research and customer needs. There is no central center of Geospatial Technology research and development in ERDC. The Topographic Engineering Center (TEC) is involved in tactical military GIS activities, imagery acquisition, and survey, mapping and GPS technologies. The Remote Sensing/ GIS Center at the Cold Regions Laboratory develops Emergency Management and Water Control applications using RS and GIS technology. The CADD/GIS Technology Center within the Information Technology Laboratory (ITL) specializes in facility management CADD and GIS applications, as well as, standardization of geospatial database schemas and data dictionaries. The Construction Engineering Research Laboratory (CERL) develops GIS tools and models for environmental and facilities management on military installations. The Environmental Laboratory

(EL) develops geospatial technology in support of environmental issues associated with civil works projects. The Coastal Hydraulics Laboratory (CHL) develops watershed, groundwater and surface sediments management and coastal process tools using geospatial technology. In addition to ERDC, the Hydrologic Engineering Center (HEC) specializes in using geospatial technologies to support flood inundation and control along USACE waterways. The Civil Works Geospatial R&D Program is the focal point for geospatial technology research and development applied to Civil Works functions.

In order to take advantage of emerging technology, GD&S R&D needs to be flexible within ERDC. However, the appropriate standards need to be used and metadata generated for ALL data sets and tools. Using standards in R&D efforts will aid in transferring the technology to the field and metadata will increase the data lifecycle. ERDC shall make the metadata for data sets available to the National Spatial Data Clearinghouse, when appropriate. Any database development that ERDC performs for Military and Civil Works District offices shall use the applicable data standards and be documented appropriately with FGDC compliant metadata (See Chapter 7).

d. Headquarters. Headquarters is responsible for maintaining corporate geospatial databases; such as, Civil Works Project Data, District/Division Boundaries, Military Boundaries and USACE Inventory of Dams. As Corporate geospatial databases are developed they will be placed on the web and metadata indexed to the NSDI Clearinghouse.

Through the HQ Geospatial Program Management Team, HQ is also responsible for developing and maintaining a corporate viewer enabling all national databases to be viewed using internet GIS capabilities. This viewer, known as CorpsMap, enables quick and easy access to how USACE serves the public and the military. By supporting the development of project and national databases through the CorpsMap, it imposes a fundamental level of integration on the data.

4-2. Geospatial Data and Systems (GD&S) Manager

The GD&S Manager (formerly the GD&S POC) is a requirement of ER 1110-1-8156. USACE Division Engineers, District Engineers and Lab Directors will appoint a GD&S Manager to serve as the liaison between their command and HQUSACE (CECW-EE) on GD&S issues. The GD&S Manager is also responsible for disseminating information related to GD&S throughout their Command's geospatial data community, including field offices. Commands may opt to internally maintain separate Points of Contacts for GIS, CADD, Remote Sensing and Surveying and Mapping, but the GD&S Manager will be cognizant of on-going and planned efforts in these areas and will be the focal point for information exchange between the command and HQUSACE. The GD&S Manager (along with the Command's Geospatial PMT) is responsible for providing guidance on implementing GD&S into Project workflow. It is recognized that the GD&S Manager cannot be intimately knowledgeable on all District Projects; however, the GD&S Manager should provide initial, limited guidance to PM's and Operations on the potential use of Geospatial technologies to the project and operations. A database of GD&S Managers is maintained at http://gis.usace.army.mil.

The GD&S Manager may also be asked to serve on committees or groups to develop GD&S policy or implement the GD&S Strategic Focus. When a GD&S Manager works on a specific initiative, HQUSACE will pay travel and per diem costs to the District Office. The GD&S Manager may also be asked to serve on state or local groups involved in coordinating regional GD&S activities. Participation in such groups is highly encouraged, but is ultimately at the discretion of the command. Funding for such participation is not provided by such groups or their members. Therefore, the command will need to determine whether funding is available. In some cases, the command may authorize the use of project funding when there is a direct relationship between the coordination group's activities and the particular project.

GD&S Manager Responsibilities:

1) Serve as the liaison between their Command, Division, and HQUSACE on GD&S related issues
2) Provide limited technical guidance on implementing GD&S technology into project workflow
3) Provide updated DPN information to ERDC-TEC by 31 December each year
4) Coordinate submission of metadata to the corpsgeo1 site
5) Prepare internal guidance on metadata submission requirements
6) Coordinate and ensure compliance with all metadata requirements
7) Review their Districts web page on the USACE Clearinghouse Node and provide changes to the Corpsgeo1 webmaster by 31 December each year
8) Chair the Command's Geospatial Program Management Team (PMT)

To effectively represent their Command, the GD&S Manager should have a good to excellent understanding of GD&S technology and related technical issues. If the GD&S Manager does not have academic credits or hands-on experience with GIS related technologies, the District will send the GD&S Coordinator to USACE's PROSPECT Courses: Introduction to GIS (Course #205) and Intermediate GIS (Course #167). "GIS" is specified in these course titles because GIS inherently integrates information from a variety of GD&S sources. Since the GD&S Manager is responsible for providing technical guidance on implementing GD&S technology into Project workflow, they need a good to excellent understanding of integration issues.

4-3. HQUSACE Geospatial Data and Systems Coordination

The Technology Integration Branch of Engineering & Construction Division, Directorate of Civil Works, HQUSACE (CECW-EE) will serve as the focal point for establishing Geospatial policy for USACE and integration of geospatial technologies into USACE workflow in an organized fashion. CECW-EE is the HQ proponent for the CADD/GIS Technology Center, the Remote Sensing/GIS Center, the Survey & Mapping Center of Expertise, and the Photogrammetric Center of Expertise.

a. HQUSACE Geospatial Data and Systems Manager. CECW-EE will appoint a GD&S Manager for USACE to coordinate representation on the Federal Geographic Data Committee (FGDC), act as technical monitor for geospatial work on the Civil Works R&D program, serve as the HQ proponent for geospatial PROSPECT courses.

b. HQUSACE Geospatial Data and Systems Coordination Committee. The HQUSACE GD&S Coordination Committee is chaired by CECW-EE, composed of HQUSACE personnel who play a role in GD&S, and addresses GD&S issues from a corporate perspective. Each participating HQUSACE Directorate, such as Information Management, Real Estate, Civil Works, Military Programs, and Research and Development, will nominate a member to this committee. The Coordination Committee will meet at least twice per year. The chair will support the USACE GD&S Manager, will grant waivers of compliance for ER 1110-1-8156, will review information copies of Command GD&S implementation plans and evaluation reports, and will consider funding GD&S Field Advisory Group recommendations and other corporate GD&S activities.

4-4. USACE District Commands.

a. USACE District Commanders. ER 1110-1-8156 requires District Commanders to perform two actions. First, Commanders will appoint a GD&S Manager to act as a liaison between the command and HQUSACE/CECW-EE (See Section 4-2). Second, USACE Commanders are required to certify that their Command has accessed the Clearinghouse, contributed metadata to the Clearinghouse, determined via the Clearinghouse that needed geospatial data are not available from an existing source, and that possible data collection partnerships have been explored. This certification, included as Appendix B in ER 1110-1-8156, will be submitted to USACE annually as part of the Civil Works Budget submittal.

b. Geospatial Program Management Team (PMT). The Geospatial PMT is a requirement of ER 1110-1-8156. This group is formerly the GD&S Technical Subcommittee. The purpose of this committee is to promote interoperability among the various GD&S efforts within the USACE Command from a corporate perspective. The Geospatial PMT will work with the Command's Project Review Board or Information Resource Management Steering Committee (IRMSC) to address funding implementing geospatial technologies in their Command. The Geospatial PMT is comprised of members selected from all persons responsible for geospatial data management and other interested persons in the USACE Command. This includes, but is not limited to, those working in the areas of planning, environmental analysis, project management, CADD, aerial photography and remote sensing, information management, water quality analysis, emergency management, engineering design, facility management, real estate, regulatory functions, geotechnical analysis, hydrographic and land surveying, terrain analysis, economic analysis, and forestry. The final composition of the Committee, is defined by the Command. The chair of the Geospatial PMT should be rotated among the membership.

The responsibilities of the Geospatial PMT are:

- Through the GD&S Manager, work with the Command's Project Review Board and Information Resource Management Steering Committee to ensure Geospatial technologies are being implemented consistently with adequate support throughout the Command ensuring a high level of interoperability.

- Develop, review and update the Commands Geospatial Project Management Plan (PMP) (See Chapter 5)

- As needed, establish a Enterprise GIS (EGIS) Project Delivery Team (PDT) as outlined in Chapter 2

- Ensure that the Command documents new geospatial data (data created after January 1995) using the FGDC Content Standard for Digital Geospatial Metadata.

- Ensure that the Command documents existing (pre-Janaury 1995) geospatial data to the extent practical.

- Ensure that the Command submits metadata to the Clearinghouse**.**

- Ensure that the Command Utilizes the Clearinghouse prior to spending Federal funds on data collection or creation, to determine if the required data already exists.

- Ensure that the Command provides public access to geospatial data within public law

- Assist in the advancement and application of GDS technology within the command

4-5. USACE Geospatial Data and Systems Advisory Group

The USACE GD&S Advisory Group (GDAG) is a field group that assists HQUSACE in defining the role of the Corps of Engineers in the National Spatial Data Infrastructure and recommends implementations of geospatial data standards and related technologies within USACE. The GDAG is composed of approximately one representative from a District in each Division, one from each USACE R&D Laboratory, and at least one from a Division HQ. The members are selected by CECW-EE based on their expertise in GD&S technologies and applications, and approved by their commands. They meet annually and are funded for travel and per diem costs.

Need to identify various groups and discuss their relationship: Civil Works Field User Group, Geospatial R&D Field Review Group, SAC/FAC, GIS Emergency Management Cadre, etc.

4-6. Staffing GD&S Positions

USACE Commands are not required to create new positions to support the requirements of ER 1110-1-8156. As GD&S technology advances within the organization and becomes an integral part of conducting the mission, GD&S skills will become part of many job descriptions. Commands may want to establish new positions in order to effectively use GD&S technology. This section provides some guidance on GD&S staffing, but does not mandate establishment of specific positions.

Currently there are no formal GD&S titles in the Federal Civil Service. However, it is not uncommon to include specific GD&S skills in position descriptions or even to use informal titles, such as GIS Specialist, in job announcements. There have been attempts to develop formal GD&S titles in the past with no success and there is unlikely to be success in the current environment which emphasizes general categories to promote staffing flexibility. A set of GD&S functions is listed in Table 3.1. How these functions are implemented and staffed is up to the Command. Representative paragraphs for GD&S related positions are provided in subsections 3-7.a through 3-7.e of this Chapter. Additionally, example GD&S job discriptions are included in Appendix I.

As indicated by their responsibilities, the GD&S Manager understands GD&S technical issues, but is also a senior level employee who understands USACE mission areas. In order to effectively coordinate GD&S at a Corps District office, the GD&S Manager should be a GS 12/13 Physical Scientist, Geographer, Engineer, Computer Specialist, or other qualified classification.

Table 4.1
Sample GD&S Functions

Function	Grade	Representative Responsibilities
GD&S Manager	GS 11-12-13 (1 FTE)	GD&S Command Manager, Coordinates the GD&S efforts within the USACE Command. Serves as technical advisor to the Oversight Committee. Permanent member of the Technical Committee. Responsible for Marketing and originating ties with mission areas.
Geospatial Data Custodian	GS 7-9-11 (1 FTE)	Acts as a Geospatial data librarian or data steward. Implements data validation procedures and certifies data before it is posted to Intranet or Enterprise GIS.
Database Development/Collection		SDSFIE and Metadata collection. The responsibility of everyone collecting Geospatial Data throughout the Command.
Data Distribution	GS 9-11-12 (1/4 FTE)	Responsible for distributing data and metadata via Intranet or Internet.
Visualization	GS 9-11-12 (1/4 FTE)	Knowledge of Cartography and Graphics. Responsible for working with subject matter experts throughout the District in the development of maps,graphics, and visualization products.
Spatial Analyst	GS 9-11-12 (1/2 FTE)	Knowledge of Cartography and Geography. Responsible for working with subject matter experts throughout the District in applying GIS tools to a project or study.

a. Spatial Analyst Skills. Is responsible for planning and executing studies relating to the characterization of physical and cultural attributes of environments for use in USACE civil works projects and military activities/operations. Duties and responsibilities require knowledge of and experience with GDS, computers, the geographic sciences, and digital geospatial data processing. Must be able to design and build new GDS applications using commercial software tools. Provides expert knowledge to other engineers and scientists (e.g., geologists, geographers, hydrologist, mathematicians, ecologists, and physicists) in setting up and conduction programs and projects. Formulates conclusions from spatial analyses to supplement that of the lead scientist or program manager.

Plans and directs field studies to collect data to determine the quantitative relation between various environmental factors and components of structural and nonstructural alternatives for civil works and military projects. These studies include on-site data acquisition, airborne remote sensing missions, use of conventional surveying techniques, and use of automatic sensing and recording instrumentation.

Participates in the directions of office studies, negotiates with other offices (USACE Districts and Divisions, U.S. Department of Agriculture, USGS, etc.) and organizations such as universities, research institutions, and commercial concerns, for existing information or cooperative work relying on own professional skills to review, interpret and analyze information; formulate approaches; reach conclusions; and make recommendations. Develops methods and performs studies involving the comparison of geographical regions and specific sites for the purpose of determining degrees of analogy.

Performs administrative duties appropriate for the technical work described, directs the work of professional and nonprofessional employees of lower grade and checks performance for quality of work and rate of performance; is responsible for knowledge and observance of all regulations applicable to the work described.

b. Visualization Skills. Is responsible for preparing maps, graphics, web-pages, displays and other visual devices for conveying information related to Civil (and military) programs. Duties and responsibilities require knowledge of and experience with GDS, computers, the geographic sciences, graphic and cartographic design, and digital geospatial data processing. Must be able to layout and produce hardcopy and electronic output for presentation of various physical and cultural features. Provides expert knowledge to other staff (e.g., geologists, geographers, hydrologist, mathematicians, ecologists, and physicists) in presenting information in an aesthetic and visually appropriate manner. Must have experience with using three-dimensional data for the purposes of visualization and presentation. May work with other team members on issues of ADA Section 508 compliance.

c. Data Distribution Skills. Is responsible for providing data to internal and external users. Duties and responsibilities require knowledge and experience with GDS, computers, the geographic sciences, and digital geospatial data processing. Must be able to discern users' needs from basic requests, use metadata to locate data sets, and generate appropriate formats (CD, compressed file, etc.) for the users. Advises other staff and external customers on accessing and distributing USACE data. Often works with other team members to distribute geospatial data to external customers; may use the internet, worldwide web, and ftp to distribute data.

d. Database Development/Collection Skills. Is responsible for developing and acquiring geospatial data using appropriate tools and sources. Duties and responsibilities require experience with GD&S, computers, geographic sciences, various source materials, and digital geospatial data processing. Must be capable of converting data from various graphic and non-graphic formats to electronic formats, and from various electronic and hardcopy media. Must have first hand experience with FGDC-compliant geospatial data documentation (metadata). Provides expert advice to other staff on the most effective and timely methods for data development, collection, and acquisition. May work with GPS, pen-based computers, and other field collection devices. Coordinates with Counsel on data license and access issues related to acquisition data from external sources. Often works with external personnel and organizations to acquire existing data. May use the internet, worldwide web, and ftp for acquiring external data.

e. Data Custodian Skills . Is responsible for geospatial data organization and maintenance in coordination with GD&S users. Duties and responsibilities require experience similar to Database Development/Collection. Additionally, the Data Custodian function requires experience with developing and maintaining database structure, database normalization, and indexing. A Data Custodian must have first hand experience with the specific database management software that the command uses. In consultation with GD&S and and non-GD&S staff, develops data validation and certification routines and policies to ensure that data are ready for release to customers and the public. Works with staff to develop and recommend such policies for approval to the Command's GD&S Oversight committee. May work with Data Distribution staff to distribute geospatial data to external customers.

4-7. Professional Qualifications and Training

In general, each GD&S professional should have backgrounds in a discipline that relies on spatial or locational information. Such fields include geography, cartography, remote sensing, civil engineering,

biology, oceanography, urban and regional planning, agronomy, forestry, landscape architecture, and geology. Course work in GD&S topics is also crucial to GD&S positions.

In the present environment the progression for a GD&S professional is similar to the apprentice, journeyman, master sequence in the crafts. Commands should be aware that GD&S professionals will require continuing education in order to maintain their technical proficiency and currency with hardware and software.

There are a number of sources for GD&S training, which make entry into the area and continuing education readily available. For a list of GIS education and training resources, see the Education section of http://www.tec.army.mil/gis/index.html.

a. USACE Training. The Proponent Sponsored Engineer Corps Training (PROSPECT) Program courses are developed to meet unique USACE training needs. They are taught by USACE ERDC or HEC employees or by contractors and some provide continuing education credits. Currently, Geospatial PROSPECT courses include: GIS Introduction, GIS Intermediate, GPS/GIS Applications, Remote Sensing Course, Flood Damage Tools – GIS, GIS-Hydrologic Engineering, The POC for PROSPECT courses is:

Commander
U.S. Army Engineering Support Center, Huntsville
ATTN: CEHNC-TD-RG (Registrar)
P.O. Box 1600
Huntsville, AL 35807-4301
256-895-7421/7425

The Training Symposium on Geospatial Technology is sponsored by the CADD/GIS Technology Center to transfer new technology developments to USACE users. This symposium is held every two years and provides short courses, plenary sessions and technical sessions. Exhibits of commercial and USACE capabilities are provided. Announcement of the symposium is made by a memorandum from HQUSACE (CECW-EE).

b. Other DoD Training. The National Imagery and Mapping College (NIMC) at Fort Belvoir, Virginia has several courses related to GD&S technologies including database production, remotely sensed imagery, GIS, cartography, and vendor specific software training. The POC information for NIMC is as follows:

NIMC
College Administration and Policy
Office: 5855 21st Street, Suite 101
Ft. Belvoir, VA 22060-5921

(703)805-3266

http://164.214.2.59/NIMC

c. Academia. Hundreds of colleges and universities are now offering GDS programs often integrated with a well established academic departments such as geography, environmental science, geology, forestry, civil engineering, or agronomy. Numerous community colleges offer hands-on training in specific software; and many universities offer GD&S short courses. A listing is available in *Directory of Academic*

Departments Offering GIS Courses published by The American Society for Photogrammetry and Remote Sensing (ASPRS) and the American Congress on Surveying and Mapping (ACSM).

d. Vendors. Vendors provide training in the operation of software as opposed to universities that emphasize concepts and applications to problems. This training may be acquired as part of a GD&S procurement, through user groups and workshops, or through the CAD2 contract ESRI BPA, and other contracts.

e. Online Courses. Many vendors and societies offer online training at an affordable price.

f. Professional Meetings, Conferences and Symposia. Many professional organizations conduct technical meetings and offer workshops and training in GD&S technology arena. A few are listed below:

The American Congress on Surveying and Mapping (ACSM), Suite 100, 5410 Grosvenor Lane, Bethesda, MD 20814-2122

The American Society for Photogrammetry and Remote Sensing (ASPRS), Suite 210, 5410 Grosvenor Lane, Bethesda, MD 20814-2160

AM/FM International has been renamed to the Geospatial Information Technology Association (GITA) 14456 East Evans Avenue, Aurora, CO 80014-1409

The Association of American Geographers (AAG), 1710 Sixteenth Street, NW, Washington, DC 20009-3198

The Urban and Regional Information Systems Association (URISA), Suite 304, 900 Second Street, NE, Washington, DC 20002

There are also Federal Government and State Government conferences and meetings that are dedicated to GD&S. For example, USACE is a key sponsor of the CADD/GIS Technology Symposium and Exposition. This triennial meeting brings together military and civilian GD&S technology professionals from the Federal and private sectors. Other meetings and conferences include [I think all these need to be changed or removed] the Federal Geographic Technology Conference, Exposition, and DataMart; the National Geodata Policy Forum; and the National GIS Council (NSGIC) Annual Meeting. Individual GD&S Managers and other GD&S professionals at the Commands are usually aware of these types of meetings and conferences, and are often invited to make presentations.

4-8 Required Elements

a. Each Command shall appoint a GD&S Manager to serve as the liaison between the Command and HQUSACE for GD&S issues.

b. Each Commands shall establish a GD&S Technical Committee and a GD&S Oversight Committee.

c. Each command shall post metadata to the Geospatial Data Clearinghouse, search the Clearinghouse, and explore potential data collection partnering opportunities.